CLAIMS

What is claimed is:

1. A compatible optical pickup device to receive first and second optical disks having different thicknesses, comprising:

a light source to emit a light having a wavelength longer than 650 nm;

an objective lens having a near axis area, a ring type annular lens area, and a far axis area with respect to an apex, said objective lens

to focus the light emitted from said light source to form a first light spot when the first optical disk, which is relatively thin, is received, and a second light spot when the second optical disk, which is relatively thick, is received, and

the first light spot has an FWHM (full width at half maximum) less than or equal to 0.72 μm with respect to the first optical disk, and the second light spot has an FWHM greater than or equal to 0.8 μm with respect to the second optical disk;

an optical path changer arranged on an optical path between said light source and said objective lens to selectively change a proceeding path of incident light; and

a photodetector to receive light reflected by the received one of the first and second optical disks and having passed through said objective lens and said optical path changer, and to detect an information signal and/or an error signal.

2. The device as claimed in claim 1, wherein the first optical disk is an optical disk of a DVD family, and the second optical disk is an optical disk of a CD family.

3. The device as claimed in claim 1, wherein said light source emits the light having a wavelength between 680 - 780 nm.

4. The device as claimed in claim 3, wherein said objective lens has an effective numerical aperture greater than or equal to 0.63 with respect to the first optical disk, and an effective numerical aperture less than or equal to 0.53 with respect to the second optical disk.

5. The device as claimed in claim 1, wherein said light source emits light having a wavelength between 750 - 770 nm.

6. The device as claimed in claim 5, wherein said objective lens has an effective numerical aperture greater than or equal to 0.7 with respect to the first optical disk, which is relatively thin, and an effective numerical aperture less than or equal to 0.53 with respect to the second optical disk, which is relatively thick.

7. The device as claimed in claim 1, wherein said objective lens has an effective numerical aperture greater than or equal to 0.7 with respect to the first optical disk, which is relatively thin, and an effective numerical aperture less than or equal to 0.53 with respect to the second optical disk, which is relatively thick.

8. The device as claimed in claim 1, wherein the ring-type annular lens area of said objective lens is optimized to the second optical disk so that,

when the first optical disk is to be reproduced/recorded, the light that forms the first light spot passes through the near axis area and the far axis area and is focused on an information recording surface of the first optical disk, and

when the second optical disk is to be reproduced/recorded, the light that forms the second light spot passes through the near axis area and the annular lens area and is focused on the information recording surface of the second optical disk.

9. The device as claimed in claim 4, wherein the ring-type annular lens area of said objective lens is optimized to the second optical disk so that,

when the first optical disk is to be reproduced/recorded, the light that forms the first light spot passes through the near axis area and the far axis area and is focused on an information recording surface of the first optical disk, and

when the second optical disk is to be reproduced/recorded, the light that forms the second light spot passes through the near axis area and the annular lens area and is focused on the information recording surface of the second optical disk.

10. The device as claimed in claim 6, wherein the ring-type annular lens area of said objective lens is optimized to the second optical disk so that,

when the first optical disk is to be reproduced/recorded, the light that forms the first light spot passes through the near axis area and the far axis area and is focused on an information recording surface of the first optical disk, and

when the second optical disk is to be reproduced/recorded, the light that forms the second light spot passes through the near axis area and the annular lens area and is focused on the information recording surface of the second optical disk.

11. The device as claimed in claim 7, wherein the ring-type annular lens area of said objective lens is optimized to the second optical disk so that,

when the first optical disk is to be reproduced/recorded, the light that forms the first light spot passes through the near axis area and the far axis area and is focused on an information recording surface of the first optical disk, and

when the second optical disk is to be reproduced/recorded, the light that forms the second light spot passes through the near axis area and the annular lens area and is focused on the information recording surface of the second optical disk.

12. The device as claimed in claim 1, wherein said light source comprises an edge emitting laser or a vertical cavity surface emitting laser, and said optical path changer comprises:

a polarization hologram element to diffract the incident light to a 0^{th} order ray, or $+1^{st}$ order and/or -1^{st} order rays according to a linear polarization component thereof; and

a wave plate to change the linear polarization of the incident light.

13. The device as claimed in claim 1, wherein said light source comprises an edge emitting laser or a vertical cavity surface emitting laser, and said optical path changer comprises a beam splitter arranged between said light source and said objective lens to transmit and/or reflect incident light.

14. The device as claimed in claim 13, wherein the beam splitter transmits or reflects the incident light according to a polarization of the incident light, and further comprising a wave plate arranged between the beam splitter and said objective lens to change the polarization of the incident light.

15. The device as claimed in claim 1, further comprising a collimating lens on an optical path between said optical path changer and said objective lens.

16. A compatible optical pickup device to receive first and second optical disks having different thicknesses, comprising:

a light source to emit a light having a wavelength longer than 650 nm;

an objective lens comprising a near axis area, a ring type annular lens area, and a far axis area with respect to an apex, said objective lens

to focus the light emitted from said light source to form a first light spot when the first optical disk, which is relatively thin, is received, and a second light spot when the second optical disk, which is relatively thick, is received, and

having an effective numerical aperture greater than or equal to 0.63 with respect to the first optical disk and an effective numerical aperture less than or equal to 0.53 with respect to the second optical disk;

an optical path changer arranged on an optical path between said light source and said objective lens to selectively change a proceeding path of incident light; and

a photodetector to receive light reflected by the received one of the first and second optical disks and having passed through said objective lens and said optical path changer and to detect an information signal and/or an error signal.

17. The device as claimed in claim 16, wherein the first optical disk is an optical disk of a DVD family, and the second optical disk is an optical disk of a CD family.

18. The device as claimed in claim 16, wherein said light source emits the light having a wavelength between 680 - 780 nm.

19. The device as claimed in claim 16, wherein said light source emits the light having a wavelength between 750 - 770 nm.

20. The device as claimed in claim 16, wherein the ring-type annular lens area of said objective lens is optimized to the second optical disk so that,

when the first optical disk is to be reproduced/recorded, the light that forms the first light spot passes through the near axis area and the far axis area and is focused on an information recording surface of the first optical disk, and

when the second optical disk is to be reproduced/recorded, the light that forms the second light spot passes through the near axis area and the annular lens area and is focused on the information recording surface of the second optical disk.